REMARKS

Summary

This Amendment is responsive to the final Office Action mailed on May 2, 2003. Claims 1 and 15 are amended herein. Claim 14 and 28 are cancelled. Claims 29-32 are new. Claims 1-13, 15-27, and 29-32 are pending.

Claims 1-2, 7-16, and 21-28 stand rejected pursuant to 35 U.S.C. § 103(a) as being unpatentable over Henley (US 5,459,410) in view of Kurogane (US 6,259,424) and Poujois (US 5,274,224).

Claims 3-4, 17-18 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Henley, Kurogane, and Poujois in view of Yamakazi (US 6,147,667).

Claims 5 and 19 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Henley, Kurogane, and Poujois in view of Yang (US 6,392,427).

Claims 6 and 20 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Henley Kurogane, and Poujois in view of Anholm (US 5,043,655).

Applicants respectfully traverse the foregoing rejections in view of the amended claims and the following comments.

Discussion of Amended Claims

Claims 1 and 15 are amended to include the subject matter of claims 14 and 28, respectively. Further, claims 1 and 15 are amended to clarify that the nearby pixel comprises one of an adjacent pixel or a non-adjacent pixel (See, e.g., Applicants' specification, page 17, lines 1-9). Claims 1 and 15 are further amended to specify that the identification of the defective drive circuitry and repair of the inoperative pixel occur after fabrication of the CMOS control chip containing the CMOS drive circuitry (see, e.g., Applicants' specification, page 13, lines

9-30).

Claims 14 and 28 are cancelled to avoid duplication of claimed subject matter.

Claims 29-32 are new and are directed toward an embodiment of the invention where the inoperative pixels are identified after the CMOS control chip and liquid crystal material are assembled together (see, e.g., Applicants' specification, page 13, lines 9-30).

Discussion of Henley

Henley discloses a method for repairing inoperative pixels by providing <u>redundant</u> TFT drive circuitry for each pixel (Col. 12, lines 13-41).

In contrast, the present invention relates to repair of defective pixels having <u>CMOS drive circuitry</u>. With the present invention, logical repair of the defective pixel is accomplished while <u>avoiding</u> the overhead of a <u>redundant drive circuit</u> as used by Henley. Applicants' invention accomplishes the repair of the defective pixel <u>by connecting an inoperative pixel to the working drive circuitry of a nearby pixel</u>, avoiding the need for redundant drive circuitry as disclosed in Henley.

The Examiner has acknowledged that Henley does not disclose repairing a defective pixel by connecting an inoperative pixel to the working drive circuitry of a nearby pixel, as set forth in Applicants' claims (Office Action, page 2). Further, the Examiner has acknowledged that Henley does not show a display having CMOS drive circuitry, as claimed by Applicants (Office Action, page 3).

Discussion of Kurogane

The Examiner indicates that Kurogane discloses connecting

the driver of one pixel to fix a defect in another pixel (Office Action, page 2). Kurogane discloses a process for building an LCD display using TFT technology. In Kurogane, a defective transistor 1A is not electrically connected to the pixel electrode 2A, and the pixel electrode 2A of the defective pixel 21 A is electrically connected to the pixel electrode of the adjacent normal pixel 22B (Col. 9, lines 57-64; Figure 7).

The disclosure of Kurogane is limited to connecting the defective pixel to the drive of an immediately adjacent pixel. In contrast, the present invention is not limited to immediately adjacent pixels. The methods and apparatus of the present invention are suitable for connecting the repaired pixel to other pixel drives besides that of immediately adjacent pixels. With Applicants' claimed invention, the inoperative pixel is connected to the working drive circuitry of a nearby pixel. As set forth in Applicants' claims, a nearby pixel may comprise an adjacent pixel or a non-adjacent pixel. Such a repair strategy is not available in the LCD displays of Kurogane, since there is limited room for routing connections in the LCD layers. The use of CMOS technology provides greater flexibility for connections between layers, thus enabling the repair to be accomplished between non-adjacent pixels as well as adjacent pixels, rather than only adjacent pixels as disclosed in Kurogane.

Kurogane does not disclose or remotely suggest methods that are suitable for connecting working drive circuitry to non-adjacent inoperative pixels, as claimed by Applicants.

The technology disclosed in Kurogane is limited to the field of LCD displays built using TFT technology. Applicants' claims are directed towards repairing defective pixels having defective CMOS drive circuitry. The Examiner has acknowledged that Kurogane does not disclose CMOS drive circuitry as claimed by Applicants (Office Action, page 4).

Further, Kurogane's disclosure is related to a method or

process of building the display. The present invention is concerned with the in-advance design of the display such that it can be easily repaired or modified <u>after</u> it is built. In particular, with Applicants' claimed invention, the defective pixel drive circuitry can be identified and the inoperative pixel is repaired <u>after fabrication</u> of the CMOS control chip containing the CMOS drive circuitry. In contrast, Kurogane discloses identification and repair of the defective pixel drives <u>during</u> intermediate TFT fabrication steps by the creation of new mask artwork (See, e.g., Kurogane at Col. 8, line 36 through Col. 9, line 22).

The present invention provides a practical solution to repairing defective pixels in displays where more complex CMOS drive circuits are employed. The method of Kurogane is not directly suitable for use in a CMOS IC production process. Even though reflective MOS microdisplays are mentioned in Kurogane, the repair process described in Kurogane of creating a custom etching mask for each unit to be repaired is likely an order of magnitude more expensive than the cost of making each unit. A complete mask set for a CMOS IC can cost hundreds of thousands of dollars, even millions of dollars. Thus the required preliminary testing and repair steps of Kurogane are not economically feasible for displays having CMOS drive circuitry.

<u>Discussion of Poujois</u>

Poujois discloses an <u>image capture apparatus</u>, such as a retina of a camera, in particular a camera used in the detection of radiation. Poujois discloses a technique for joining several matrixes edge to edge to form a large matrix for an image capture apparatus. To accommodate the addressing circuits, certain areas are <u>deliberately made inactive</u> by destroying the active elements of pixels in order to install addressing subcircuits in their

place. The information normally obtained from the destroyed
pixels is replaced in the resulting captured digital image file
by reconstituted information obtained by averaging the
information from adjacent intact pixels (Abstract).

Poujois does not disclose or remotely suggest methods or
apparatus for <u>repairing inoperative pixels</u> in a display, as set
forth in Applicants' claims. To the contrary, Poujois discloses
repairing <u>the captured digital image file</u> created where inactive
image elements are present in the capture device. In other words,
Poujois is directed towards <u>repairing a captured image file</u>
<u>resulting from a defective camera retina</u>, while the present
invention is directed toward <u>repairing a defective pixel in a</u>
<u>display in order to avoid a defective displayed image</u>.

In particular, Poujois discloses repairing <u>a captured</u>
<u>digital image file</u> by <u>averaging information</u> received by the image
elements or pixels which surround the inactive image element or
pixel (Col., 5, lines 10-14; Col. 6, line 64 through Col. 7, line
39). Poujois reconstructs the data for the defective pixel by
averaging the values of the adjacent pixels in order to
reconstitute the captured image file after image capture.

The Examiner cites to Poujois as disclosing the use of CMOS
drive circuitry in connection with pixel repair. As discussed
above, Poujois does not relate to <u>repair of the circuitry of a</u>
<u>defective pixel</u>, only repair of the <u>image file</u> captured by a
device having a defective pixel. Further, Poujois discloses the
use of CMOS technology in connection with an image capture
device, rather than a display device as claimed by Applicants.

Poujois does not disclose or remotely the repair of an
inoperative pixel by connecting it to working drive circuitry of
a nearby pixel, as claimed by Applicants. Further, Poujois does
not disclose or remotely suggest the identification of defective
CMOS drive circuitry for the inoperative pixel <u>after fabrication</u>
<u>of said CMOS control chip</u>. In contrast, the drive circuitry of

Poujois is deliberately disabled, so no identification of the defective drive circuitry is necessary.

The examiner has indicated that it would have been obvious to combine the disclosure of Henley with that of Kurogane and Poujois to arrive at the claimed invention. However, Applicants respectfully submit that a straight-forward combination of these technologies would not have been obvious to one skilled in the art at the time of Applicants' invention. Poujois does not relate to image displays in general, and does not relate to repair of pixels having defective drive circuitry as claimed by Applicant. Kurogane does not disclose the use of CMOS drive circuitry and is limited to the repair of an immediately adjacent pixel. Henley accomplishes the pixel repair using <u>redundant circuitry</u>.

To combine Henley and Kurogane to arrive at the present invention would require that the disadvantages of using redundant circuitry of Henley be removed, in addition to overcoming the preliminary detection and repair process required by Kurogane. Neither reference teaches how to overcome these issues. Further, one skilled in the art would not be motivated to look to Poujois for teachings relating to pixel repair in a display device, since Poujois teaches only <u>captured image file repair</u> in an image capture device. Further, Poujois teaches only averaging of pixel values to provide a value for a deliberately deactivated pixel, and is not concerned with connecting drive circuitry to inoperative pixels. The combination of Kurogane, Henley and Poujois taken as described (and in the absence of the teachings of the present invention) is insufficient to result in the functionality embodied by the present invention without further creative thought.

Only with hindsight gained impermissibly from Applicants' disclosure could one of ordinary skill in the art have arrived at the claimed invention from the combination of Kurogane, Henley and Poujois. Moreover, there are no detailed teachings in any of

these prior art references that would have motivated or enabled
one skilled in the art to combine them as suggested by the
Examiner.

Further, Applicants respectfully submit that a combination
of Henley, Kurogane, and Poujois would not result in the
invention described in Applicants' amended claims. None of the
references disclose or remotely suggest that defective CMOS drive
circuitry for the inoperative pixel is identified and repaired
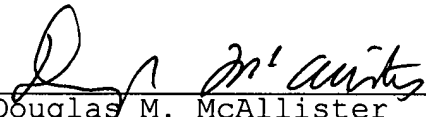after fabrication of said CMOS control chip.

Applicants respectfully submit that the present invention
would not have been obvious to one skilled in the art in view of
the combination of Henley, Kurogane, and Poujois, or any of the
other prior art of record.

Further remarks regarding the asserted relationship between
Applicants' claims and the prior art are not deemed necessary, in
view of the amended claims and the above discussion. Applicants'
silence as to any of the Examiner's comments is not indicative of
an acquiescence to the stated grounds of rejection.

Conclusion

In view of the above, the Examiner is respectfully requested to reconsider this application, allow each of the presently pending claims, and to pass this application on to an early issue. If there are any remaining issues that need to be addressed in order to place this application into condition for allowance, the Examiner is requested to telephone Applicants' undersigned attorney.

Respectfully submitted,

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